

REMARKS

I. Case status

Claims 1-30 are pending in the above-identified application. Claims 1-30 stand rejected for non-obviousness. With this response, claims 1, 10, 23 and 30 are amended. Support for these amendments is found throughout the specification; for example, at Paragraph [0058] and Figure 7. No new matter has been added.

II. Interview Summary (37 CFR § 1.133)

The undersigned attorney and Oliver Strimpel thank Examiner MacArthur for the courtesy of a telephone interview on March 23, 2006. The patentability of the pending claims over cited references (US 6,350,179 ("Campbell '179"), US 6,230,069 ("Campbell '069") and WO 98/05066 ("Holzapfel")) were discussed. The process control of Campbell '179 and Campbell '069 and the thickness measurements of Holzapfel were discussed. Examiner MacArthur proposed, and applicant agreed, to amend the claims substantially as is shown in the amended claims above.

III. Patentability of the claims over Campbell '179, Campbell '069 and Holzapfel.

Campbell '179 and Campbell '069 were relied upon in the Office Action to disclose a method for polishing a wafer using a polishing recipe. Holzapfel was relied upon in the Office Action as teaching a method and apparatus for the in-process detection and measurement of thin film layers. Applicants submit that the combined disclosures of these references do not teach or suggest the claimed invention.

The current invention is directed to methods and apparatus for polishing at least two layers of a wafer in a CMP process. Each independent claim 1, 10, 23 and 30 contains (or substantially contains) the following features:

“a model for CMP processing of a wafer having at least first and second layers comprising at least one control parameter, said model comprising a first component that predicts a value for a characteristic of the first layer and a second component that predicts a value for a characteristic of the second layer”; and
“polishing at least first and second layers of a wafer” using a process recipe based on the model.

While Campbell ‘179 and Campbell ‘069 disclose methods for polishing a wafer using a polishing recipe, nothing in the art of record discloses or suggests the polishing of “at least two layers” of a wafer, much less a wafer CMP processing model that provides “a first component that predicts a value for a characteristic of the first layer and a second component that predicts a value for a characteristic of the second layer.”

The Office Action refers to Figure 5 of Holzapfel and the related text as teaching a method and apparatus for the in-situ detection and measurement of thin film layers. As discussed during the examiner interview, Holzapfel does not disclose the modeling or measurement of a wafer having “first and second layers.” Holzapfel describes a method of determining the thickness of a ‘layer’ (for example, oxide layer 402 in Figure 5) that is disposed on a substrate (for example, substrate layer 406 in Figure 5). In other examples, Holzapfel discloses a method of detecting when a first material layer has been removed from a second

material layer (page 14, lines 3-5). Although the first material layer may be made of up multiple layers (see, Figure 10), Holzapfel does not disclose or suggest that the multiple layers are treated individually. To the contrary, Holzapfel discloses measuring the thickness above an interfacial layer 604, but cannot distinguish if the layer above the interfacial layer is a plurality of layers or a single layer as illustrated in Fig. 10 by element 612 and in Figure 11 by element 618. Thus, Holzapfel fails to disclose or suggest measurement or prediction of characteristics for first or second layers of a wafer.

Similarly, Campbell '179 and Campbell '069 also lack these features.

Campbell '179 discloses determining a polishing recipe for a layer of a wafer based on the measured pre-polished thickness of the layer (col. 5, l. 13-16). Campbell '069 discloses a model for controlling the post-polishing thickness of a wafer layer (col. 3, l. 39-41). There is no disclosure or suggestion of a wafer with multiple layers or of a method of determining a polishing recipe for a multilayer wafer. Nor is there any suggestion to distinguish between multiple layers of a wafer in either a model or a measuring step. Lastly, Campbell '179 uses measured layer thickness to determine a process recipe for the current wafer and does not disclose or suggest providing a "process recipe for use in processing (polishing) a subsequent wafer."

In summary, the cited references, either alone or in combination, do not disclose or suggest numerous claim elements, including "a model for CMP processing of a wafer having at least first and second layers comprising at least one control parameter, said model comprising a first component that predicts a value for a characteristic of the first layer and a second

component that predicts a value for a characteristic of the second layer” (claims 1, 10, 23, 30); and “polishing at least first and second layers of a wafer” using a process recipe based on the model (claims 1, 10, 23, 30).

For the foregoing reasons, it is submitted that independent claims 1, 10, 23 and 30 and those claims dependent thereon are patentable over the art of record and are in condition for allowance. A favorable Notice to that effect is respectfully requested.

IV. Miscellaneous

Applicant requests the return of signed PTO Forms 1449 previously submitted on June 16 and August 11, 2004 (courtesy copies enclosed).

The Commissioner is hereby authorized to charge any fees should any be required for this submission, or credit any overpayment to Deposit Account No. 08-0219.

In the event that an Extension of Time is required, the Commissioner is requested to grant a petition for that Extension of Time which is required to make this response timely and is hereby authorized to charge any fee for such an Extension of Time or credit any overpayment to Deposit Account No. 08-0219.

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Respectfully submitted,

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